



The Impact of International Climate Agreements on Environmental Policy in Punjab

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Abstract: This paper examines the influence of international climate agreements, most notably the UN Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, on environmental policy formulation and implementation in Punjab in India. By analyzing ways in which global commitments, normative pressure, technical guidance, financial & technological support, legal & political commitments, etc., influence the sub-national level governance systems and policies, the study reveals the ways in which the state of Punjab has absorbed international climate commitments in its sub-national level initiatives. Key areas of policy alignment include areas such as renewable energy adoption, air quality management, climate resilient agriculture, water resource management, and public capacity building programs. Despite these efforts, there are still challenges in getting international goals to effective local action, given the aspect of fragmented governance, lack of resources, socio-economic trade-offs, political fluctuations, and behavioral barriers. The research highlights that although the state of Punjab is demonstrating considerable alignment to global climate frameworks to achieve comprehensive environmental outcomes, this would necessitate better institutional coordination, sustained political will, greater access to international funding and technology, and more specific public engagement. The paper concludes with recommendations for enhancing the climate governing structures in Punjab, so that international climate commitments effectively provide the basis for sustainable local adaptation policy balancing environmental, economic, and social goals.

Keywords: International Climate Agreements, UNFCCC, Paris Agreement, environmental policy, Punjab, Renewable Energy, Air Quality Management, Sustainable Development, Greenhouse Gas Mitigation, Non-CO₂ Pollutants

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INTRODUCTION

Climate change is one of the most serious issues of the 21st century with far-reaching social, environmental, and economic repercussions. Rising global temperatures, extreme climatic events, and ecosystem disruption are all threatening global human well-being, agricultural productivity, water resources, and human health. In response, nations have increasingly initiated international climate agreements focused, among others, on the mitigation of greenhouse gas (GHG) emissions and sustainable development. Among these, the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement are important milestones in the formulation of global frameworks for concerted action on climate change. These agreements give direction, set targets, encourage transparency, and mobilize resources for affecting national and sub-national environmental policies. An agriculturally intensive and densely populated state in northern India, Punjab is faced with acute environmental challenges such as the burden of air pollution, scarcity of water, soil degradation, and heightened vulnerability to the heat extremity of climate change. As a state that relies heavily on agriculture and industrial activity, the state of Punjab is especially vulnerable to the effects of climate variability. In this context, the impact of international climate agreements on state-level policy towards the environment

becomes an important field of research. Understanding this influence can help to shed light on how global norms are translated into practical interventions that work and contribute to addressing and filling the gaps that exist between Riley International aspirations and local realities. This paper has focused on the role and influence of global climate commitments, especially the UNFCCC and Paris Agreement, on environmental governance in the Punjab. It examines mechanisms of influence that international agreements have on states down to the state level, including normative pressure, technical advice, access to finance and technology, and legal-political commitment. By taking a look at the various environmental initiatives taken by the state of Punjab, including the adoption of renewable energy, air quality management, climate resilient agriculture, water resources, and capacity building programmes, the study draws policy relevance and reveals areas of policy convergence, advances, and ongoing challenges. In so doing, this research aims at developing a comprehensive understanding of the effect of international climate agreements on sub-national environmental policy. It also provides insights into approaches to improve climate governance in Punjab, so that global commitments translate into effective local action that balances the concerns for environmental sustainability, economic development, and social well-being.

INTERNATIONAL CLIMATE AGREEMENTS AND THEIR GOALS

International climate agreements are the central tools of changing environmental governance on a global scale. They provide legal, technical, and normative frameworks for informing national and sub-national governments about formulating climate policies. These agreements set global goals on mitigation and adaptation, propose mechanisms of accountability, and mobilize resources for sustainable development. By bringing global incomes down to the local level, states such as Punjab can work to design policies which would tackle climate change, environmental degradation, and socio-economic development all three at the same time.

UNFCCC and the Paris Agreement

The United Nations Framework Convention on Climate Change (UNFCCC), adopted at the Earth Summit in Rio de Janeiro in 1992 aims to stabilize greenhouse gas (GHG) concentrations at levels that would prevent dangerous human interference with the climate system. It establishes a principle of responsibility that is common but differentiated, acknowledging that developed countries have created a technique extra emissions and hence more responsibility in battling climate change. The UNFCCC provided the basis for further protocols, such as the Kyoto Protocol and the Paris Agreement, making functional its goals aimed at reducing greenhouse emissions through binding and non-binding mechanisms. The Paris Agreement 2015 is a momentous global agreement to limit the increase in global average temperature to well below 2 degC, with an ambition to limit it to 1.5 degC above pre-industrial levels. The main emphasis of the Agreement is not only on mitigation of GHG emissions but also on adaptation, resilience, and sustainable development. Its key instrument, Nationally Determined Contributions (NDCs), obliges countries to set emission reduction goals and adaptation strategies voluntarily, depending on national priorities. Although emission targets under the Paris Agreement are not legally-binding, reporting, transparency, and global stocktaking mechanisms generate normative and political accountability. Additionally, the Agreement facilitates financial support, technology transfer, and capacity building assistance for developing regions to help states implement climate initiatives despite resource constraints.

United Nations Framework Convention on Climate Change (COP 19), Warsaw, November 11–22, 2013

At the United Nations Climate Change Conference in Warsaw (COP 19), held from November 11th to 22nd 2013, governments negotiated a small package of decisions intended to ensure the international climate discussions remain on track, while showing the important challenges that confront in achieving a comprehensive global agreement in Paris in 2015. COP 19 (officially the Nineteenth Session of the Conference of the Parties to the UNFCCC) marked one of the halfway points in the Durban Platform negotiations begun two years earlier. A key issue of the conference was to define more clearly the final two years of discussions, especially relating to the submission of Intended Nationally Determined Contributions (INDCs). Parties agreed that countries willing to submit their INDCs could do so by the first quarter of 2015, although the conference had great care not to set out the final structure of the Paris Agreement. Other key issues included demands from developing countries for more climate finance and establishing mechanisms for reducing unavoidable loss and damages caused by climate impacts. The urgency of the latter problem was highlighted by recent devastation wrought by Typhoon Haiyan in the Philippines. While the developed world agreed earlier to pledge to mobilise \$100 bn a year by 2020, they refused to commit to an interim goal, and the newly set-up Warsaw International Mechanism for Loss and Damage provided information sharing and expertise, but no more funding. Key features of the conference were that there was still much work to do on fundamental issues, such as the legal character of the new agreement and how to differentiate obligations between developed and developing countries. A significant substantive result was the formal recognition that the contributions to be included in the Paris Agreement would be nationally determined as a reflection of each country's situation and the circumstances. The negotiations have also shown changing positions, with the United States and the European Union showing closer alignment in what their ideal global climate deal should look like, while the once-united Group of 77/China showed growing divisions as smaller developing countries displayed more flexibility than the big emerging economies like China, India, and Brazil.

United Nations Climate Change Conferences: COP 20, COP 21, and the EU Environmental Policy Context

The 20th Session of the Conference of the Parties (COP 20) to the UNFCCC, held in Lima, Peru from December 1 - 12, 2014, ended 30 hours after its deadline with a rather modest set of procedural decisions. While the conference passed the Lima Call for Climate Action that provided loose arrangements for countries to put forward their Intended Nationally Determined Contributions (INDCs) to the Paris Agreement, it made little progress on the larger issues of substance, leaving significant negotiation challenges unresolved. The meeting sent the "elements for a draft negotiating text," which gathered issues and options from the parties, but specifically refrained from convergence as there was still space for development of further proposals. COP 20 marked the third of a four-year negotiating cycle, trying to reach conclusions by the time the meeting took place in Paris. Despite initial momentum, including nearly \$10 billion pledged to the Green Climate Fund and the mentioned, joint U.S.-China post-2020 emission targets, negotiations were bogged in procedural wrangling over submission and assessment of national contributions. The conference had also illustrated lingering tensions between approaches taken by the developed and the developing countries in specific issues such as historical responsibilities on emissions

reductions and financial commitments, and showed little progress on issues like market mechanisms, climate finance, and loss and damage.

The next COP 21 held in Paris (December 2015), marked a historic breakthrough with nearly 200 countries signing the first universal climate agreement. The Paris Agreement binds countries to keeping global warming well below 2°C above pre-industrial levels, and to try to limit it to 1.5 °C, all with a proviso that countries are free to decide for themselves how they can achieve this. Developed nations have committed to provide \$100 billion a year in 2020 to help developing countries cut emissions, although the text leaves open the meaning of climate finance. Countries submitted initial mitigation plans, but these were acknowledged as low-lying to achieve long-term targets and understood impact on the need for deeper emission reductions over time. Notably, the agreement moved away from strict historic responsibility, requiring action of all countries, including developing countries, but with a degree of differentiation and stressing cooperation regarding technology transfer and adaptation. The text also made it clear there would be no provisions for loss and damage involving legal liability for developing countries as a sign of compromise in the contradiction of equity and first participation worldwide. Parallel to the UNFCCC process, the European Union (EU) has established one of the purest regional environmental frameworks in the world.

Although early European treaties did not grant explicit environmental authority, the 1986 Single European Act made environmental policy formally part of EU legislation, leading to both home-rule action and negotiating international agreements. The EU has always had ambitious climate goals, such as the phasing out of CFCs and halons, the reduction of GHG emissions 8-20% below 1990 levels, and the EU Emissions Trading System (EU-ETS), the world's biggest carbon market that covers almost 45% of EU emissions. Institutional mechanisms such as the European Environment Agency (EEA) are available for data, monitoring, and analytical backing for better policy coordination within countries and also for international cooperation. The environmental strategy of the EU - as enunciated and reinforced by the Maastricht Treaty - marks it as a global leader - in mitigation, clean energy transition and climate diplomacy with an emphasis on enforceable targets, monitoring and transparency to achieve compliance, much of which has implications for emerging economies and sub-national actors such as Punjab in the implementation of international commitments as a policy.

Collectively, the results of COP 20 and COP 21, together with the experiences of environmental governance at the EU-level, suggest the need for transparency, national planning, and institutional capacity building at the implementation level of climate agreements. They include demonstrating the need for financial, technical, and procedural support for the developing regions, the flexibility for differentiated responsibilities, and the iterative nature of international negotiations in achieving the balance between global objectives and national and sub-national climate action.

Mechanisms of Influence

International climate agreements influence domestic and state-level policies through four primary mechanisms:

1. **Normative Pressure:** Global climate agreements, which set global standards in the reduction of

emissions, the use of renewable energy, and climate change adaptation. States such as Punjab are under political and social pressure to bring their local policies in line with such standards and reinforce the importance of sustainable governance.

2. **Technical Guidance:** Through the frameworks provided by UNFCCC and Paris Agreement, states have access to methodologies for GHG monitoring, reporting, and verification as well as guidance on planning for climate resiliency infrastructure, sustainable agriculture, and burning of renewable energy.
3. **Access to Finance and Technology:** International mechanisms like the Green Climate Fund (GCF) and Global Environment Facility (GEF) help the Punjab with implementing renewable energy projects, pollution control systems, and climate adaptation initiatives, which may not be possible due to financial constraints.
4. **Legal and Political Commitments:** Ratification of international agreements prompts national governments to make climate commitments into federal law, such as the Energy Conservation Act (2001) and the Air (Prevention and Control of Pollution) Act (1981), which subsequently results in national action on the state level. For Punjab, this means translating policy measures, which are in tune with India's NDCs and general international objectives.

Punjab-Specific Examples of Policy Alignment

Punjab, being an agriculturally-intensive and industrially developing state, faces major environmental risk issues such as air pollution, water scarcity, degradation of the soil, and vulnerability to climate change. International climate pacts have directly contributed to several state-level policies and initiatives:

1. **Renewable Energy Adoption:** Under the aegis of the low-carbon development emphasis of the Paris Agreement, renewable energy adoption has been given a high priority in Punjab in the Punjab State Renewable Energy Policy (2020). This policy is favourable to solar and biomass energy projects with a view to increasing the share of clean energy in the state's energy mix. Incentives such as subsidies for installing solar systems on rooftops, feed-in tariffs, and public and private partnerships comply with the international mitigation targets. Punjab has set a target of getting to 5 GW of renewable energy capacity by 2030; sure shot at offsetting its carbon footprint.
2. **Air Pollution Control:** Air quality in Punjab, particularly during winter months, is badly affected by the burning of crop residue, vehicular emissions, and industrial emissions. The state has taken several steps, such as mandatory use of Happy Seeder machines, banning the burning of crop residues, and extending air quality monitoring networks. These measures are in line with international recommendations under the UNFCCC and Paris Agreement to reduce emissions of these short-lived climate pollutants, especially black carbon and particulate matter. Punjab's moves are also in line with India's NDC commitments in terms of achieving cleaner air and sustainable development.
3. **Climate Adaptation in Agriculture:** International agreements place a strong focus on issues of resilience and adaptation, E. g., in vulnerable sectors, such as agriculture. Punjab has incorporated these principles in the Punjab State Action Plan on Climate Change (PSAPCC). Initiatives include promotion of climate resilient crops, water efficient irrigation method and soil conservation techniques. Addressing

the dual challenge: the state of Punjab cycles around global frameworks in an effort to go beyond seminal thresholds of faced agricultural productivity and adapt to the changing factors of climate variability.

4. **Water Resource Management:** Drying up of groundwater in the region of Punjab is a serious environmental concern. The UNFCCC and Paris Agreement promote the sustainable planning of water resources as well as integrated resource management, which has encouraged the Punjab government to develop a plan to use rainwater harvesting, micro-irrigation, and groundwater regulation policies. These types of measures are drought and climate adaptation issues that minimize vulnerability and increase water security, contributing directly to climate adaptation goals.
5. **Capacity Building and Public Awareness:** International frameworks facilitate knowledge sharing and engagement of stakeholders and technology transfer. Punjab has responded to this initiative by organizing Climate Awareness campaigns, Farmer Training Programmes, and Renewable Energy workshops, which inculcated public participation and enabled the adoption of sustainable practices in the region.

ENVIRONMENTAL POLICY IN INDIA AND PUNJAB

Environmental policy in India functions in a multi-tiered system of governance, in which international commitments (informing National strategies), in turn, are adapted to the very local ecological and socio-economic conditions by states. India's involvement with the global climate agreements has resulted in legislative, regulatory, and programmatic responses toward attaining both mitigation and adaptation. At the state level, Punjab has usurped these frameworks in the form of the targeted interventions that address its unique environmental challenges, most of all the ones resulting from intensive agriculture and rapid industrialization.

National Framework

India's national environmental policy framework has undergone significant evolution in light of the diverse imperatives at the domestic level, particularly in response to international obligations. By ratifying the Paris Agreement and remaining a party to the UNFCCC, India has also agreed to incorporate the global climate ambitions in its domestic planning processes. The centrepiece of this integration is the NAPCC, launched in 2008 with a comprehensive roadmap for climate mitigation and adaptation through eight key missions:

1. National Solar Mission – Induces massive use of solar energy resources as an attempt at diversification of the energy pool of India and to minimize dependence on fossil fuels.
2. National Mission on Enhanced Energy Efficiency (NMEEE) – aims at enhanced energy efficiency in industrial and commercial sectors through financial incentives, technology support and performance based mechanism.
3. National Mission for Sustainable Habitat (NMSH) – Foe. V - urge energy efficient urban habitat, improvement of waste management, and low carbon transportation
4. National Water Mission (NWM) – focuses on conservation, efficient use of water, and integrated

management of water resources to overcome the crisis of water scarcity and also environmental sustainability against climate change.

5. National Mission for Sustainable Agriculture (NMSA) – introduces climate-resilient crops, improved ways of irrigation, and soil health management for agricultural sustainability.
6. National Mission on Strategic Knowledge for Climate Change (NMSKCC) – facilitates research, capacity-building, as well as dissemination of knowledge on climate change for evidence-based policy formulation.
7. National Mission on Green India – to focus on the area of afforestation, ecosystem restoration, correcting biodiversity, and strengthening natural carbon sinks.
8. National Mission on Sustainable Urban Planning – to ensure integration of climate-resilient urban development practices to meet the population growth and urban environmental pressures,

India's Nationally Determined Contributions (NDCs) compel these missions by specifying hard targets such as a reduction in emission intensity of GDP by 33-35% by 2030 with respect to 2005 levels and 40% cumulative electric power capacity from non-fossil fuel sources. These targets inform policy priorities as well as their investment strategies at the national and sub-national levels, such that international commitments are operationalised at the national level.

State-Level Action: Punjab

As a federal state, Punjab put environmental policies in the framework of the ambient legal system and general laws of the country, such as the Environment Protection Act (1986), the Air (Prevention and Control of Pollution) Act (1981), and the Water (Prevention and Control of Pollution) Act (1974). However, the specific ecological and economic context of the state - with a dominance of high-intensity agriculture, industrial activities, and urban growth - calls for specific strategies to cope with environmental challenges. Key areas of concern include:

- **Air Pollution:** The entire state of Punjab is exposed to frequent spikes in particulate matter (both PM_{2.5} and PM₁₀), which is contributed to by post-harvest crop residue burning, vehicular emissions, and industrial discharges. The state has adopted monitoring networks, encouraged mechanised residue management solutions, and coordinated with national issues such as the National Clean Air Programme (NCP) to decrease the concentration of pollutants.
- **Water Scarcity and Groundwater Depletion:** Water requirement is high for intensive farming of paddy, and unchecked use of groundwater resources has caused severe water stress. Punjab has incorporated programs for rainwater harvesting, micro-irrigation, and recharging aquifers, keeping in view the national priorities of water management under the National Water Mission.
- **Soil Health and Degradation:** Continuous use of chemical fertilisers, monocropping, and mechanized farming has impacted soil fertility. State-level actions involve schemes of soil health cards, promotion of organic fertilizers, crop diversification schemes, etc., which represent a blend of the national direction in policy and local adaptation of the country.

- **Climate Vulnerability:** In light of rising temperatures or erratic rainfall and weather events, climate-specific agriculture policies focused on climate risk adaptation across the country, including drought-resistant crop varieties, sowing patterns, and community-based disaster preparedness programs.

Policy Integration with International Climate Norms

Environment strategies for Punjab, sub-national-scale implementation of the global climate commitments project:

1. Clean Energy Adoption: In tandem with the NDC commitments of India under the Paris Agreement, state solar and biomass schemes have been set up in Punjab, under which fornication for rooftop solar and not but any encouraged with the non-public joke sector model to put into renewable energy development.

2. Air Quality Management: Steps to control stubble burning, industrial emission regulations, and improve air quality monitoring indicate compliance with recommended international measures for the mitigation of short-lived climate pollutants.

3. Agro-Climate Strategies: Adaptation strategies in the agricultural sector draw on some global guidelines on climate resilience, showing that international adaptation strategies have been embedded in local adaptation strategies at the state level. Through systematic conformity of its policies to both national guidance and international climatic perspective, the state of Punjab sets an example of how sub-national levels of governance can translate global environmental goals into action and fulfill the eco-economic realities of the communities at the ground level.

INFLUENCE OF INTERNATIONAL AGREEMENTS ON PUNJAB'S POLICIES

International climate frameworks like UNFCCC and Paris Agreement have helped to influence the environmental governance much beyond the national capitals to the state level in regions such as Punjab. While the context of implementation varies, the main principles of emissions reduction, air quality improvement, and climate resilience are built into the state's developing policy architecture. The ensuing subsections illustrate how the international norms are put into specific terms in the Punjab, without repeating previously outlined descriptions of national or state policies.

Air Quality and Climate Initiatives

Punjab's air quality management strategies are becoming more in line with the goals of global climate change treaties, following the focus on monitoring, source control, multi sector coordination. Punjab has increased its air quality management infrastructure to a great extent. The state government and pollution authorities have taken a huge step in expanding the number of continuous air monitoring stations for various key pollutants like PM2.5, PM10, etc. to monitor them more accurately in urban and peri-urban areas. This initiative is part of global best practices in emissions tracking, encouraged by international agreements for robust data as a measure of policy evaluation and transparency. A case in point is Punjab's involvement in the National Clean Air Programme (NCAP-a central initiative-"strategic to 'Global Climate and Air Quality' Programmes and Agenda 2030 Global Goals"), which seeks to fill in this missing link. Under NCAP, several cities in the state have measured reduction in particulate emissions in comparison to

earlier baselines, which would indicate progress toward the emission goals, both local and global. Despite improvements for selected pollutants, many of the monitoring locations still show levels that exceed national ambient air quality standards, underscoring the need for greater levels of action and improved linkage and integration of climate and health in the planning process. Beyond being there for monitoring, local innovations like setting up Air Pollution Control Devices (APCDs) in locations of traditional sources of emissions (such as crematoriums in Patiala) indicate how the state is experimenting with context-specific solutions in order to reduce particulate matter without jeopardizing cultural practices. These practical deployments are in line with the climate agreements' focus on balancing the mantra of socioeconomic views with emission curbs.

Climate Action Plans

Punjab has made strides towards incorporating climate action planning by mainstreaming the mitigation and adaptation strategies in the formal policy instruments. The Punjab Climate Change Policy & Action Plan 2024 hosts a vision of "A Climate Resilient Punjab," which clearly connects the low-emission development and better air quality to economic and environmental sustainability objectives. This is reflecting global expectations under the Paris Agreement for jurisdictional climate action, which includes both greenhouse gas mitigation and socio-ecological resilience. The policy puts emphasis on multi-sectoral alignments: the threats of climate risks are tackled in the urban planning, agriculture, energy, and health frameworks. For instance, climate adaptation strategies comprise strengthening infrastructure to respond to erratic weather patterns, land use planning for minimum vulnerability to extreme heat events, and the mainstreaming of green investments in public development programs. Concurrently, mitigation strategies such as better energy efficiency, promoting low-emission economic activities are supporting international and national climate objectives and addressing local environmental health challenges.

Non-CO₂ Pollutants and Climate Mitigation

A major development in the climate policy in the state of Punjab has been the increasing focus on non-CO₂ pollutants - especially short-lived climate pollutants (SLCPs), which have a strong correlation with the quality of the air, and a near term climate forcing effect. While CO₂ remains the main subject of long term climate strategies, it has become increasingly clear in the international scientific and policy discourse (early through IPCC reports and parallel work in dealing with climate summits) that the benefits of addressing SLCPs owing to their high global warming potential and direct health impact.

In this regard, Punjab had taken a pioneering step by launching a landmark report - Pathways to Net Zero in Punjab: The Critical Role of Non CO₂ Pollutants. Prepared in association with the direct support of the control of Pollution of *قهرمان*-i-*Nilayem* in connection with the Punjab State Council for Science & Technology, the Institute for Governance & Sustainable Development (IGSD) and The Energy and Resources Institute (TERI), this is a state level study and calls out emissions of methane, black carbon, tropospheric ozone precursors and other reactive pollutants as the cause for key drivers of both climate change and respiratory health burdens in the region. The recommendations in the report are consistent with an approach that is compatible with the global climate goals that aim for co-benefits between mitigation and public health. By focusing on reductions in non-CO₂ emissions (through electrification of transport, clean cooking transitions, sustainable waste management, as well as agricultural emissions management),

the government of Punjab wants to achieve immediate air quality improvements while carrying momentum on long term climate goals. This parallels the integrative approach promoted in global fora such as the COP (Conference of the Parties) sessions, in which mitigation of SLCPs has been an increasing policy as a complementary measure to deep decarbonization.

By examining the climate strategy beyond CO₂, Punjab is setting an example for the rest of the country on how sub-national actors can interpret international climate expectations through bespoke scientific evaluation and a pathway of intervention. Overall, Punjab's changing environmental measures show that international climate agreements do not only outline distant targets, but they also provide information on policy goals and encourage evidence-based action and inspire integrated approaches that address complex environmental problems at the local level. Whether in improved air quality monitoring, climate action planning, or the need for tackling non-CO₂ pollutants, Alabama's changes exhibit growing possibilities to both the global climate imperatives and local developmental needs in the state of Punjab.

CHALLENGES IN TRANSLATING INTERNATIONAL GOALS LOCALLY

While international climate agreements are the source of strategic guidelines and the development of norms, there is often limited scope in effectively implementing such agreements into state-level policies due to complex institutional, economic, and socio-political factors. Punjab, while demonstrating a positive policy approach towards the challenge of climate change, faces several systemic issues in realigning local action with global climate aims to their fullest extent. Understanding these challenges is very important in designing effective and contextually-appropriate interventions.

Governance and Institutional Coordination Gaps

One of the most important challenges to operationalizing the international climate goals at the sub-national level is the fragmented governance architecture. Punjab operates in India's federal mode in which environmental activities are split up between central, state, and local authorities. While the central government works on the national policies, including the NDC targets under the Paris Agreement, states are left with the implementation at the local level. This division often leads to overlapping mandates, delays in decision-making, and inconsistent enforcement. For instance, efforts to mitigate air pollution need the coordination of the Punjab Pollution Control Board (PPCB), urban municipal authorities, and agricultural departments. Limited inter-agency communication may impede integrated efforts like those that can combine the control of stubble burning and the promotion of mechanized residue management, which requires concomitant policy support across many sectors. Moreover, in addition to state-level climate action plans, which give strategic direction, conversion of these to enforceable active climate policies, in the form of local laws and ordinances and municipal regulations, is a slow process, decreasing the speed and efficacy of adaptation and mitigation actions.

Resource and Capacity Constraints

Resource limitations (both financially and technically) are another important challenge. Implementing on a large scale renewable energy projects, air quality monitoring networks, or climate-resilient agricultural practices requires considerable investments and high technical capacities. While there are mechanisms (Green Climate Fund, technology transfer programs) at the international level, which will be able to provide

financial and technical help, access to these resources involves bureaucracy and procedural complexities. Such is the need for funds from state development budgets and conditional central funding that it could cause delays or piecemeal implementation of important initiatives in Punjab. For example, while processes such as rooftop solar schemes for solar power, and for biomass energy are compatible with Paris Agreement ambitions, inconsistent funds allocation and bureaucratic barriers have slowed the process, in particular in rural areas. Additionally, there are limited human resources with expertise in both climate science and project management and environmental monitoring, which limits the ability to design, implement, and assess comprehensive state-level climate programs.

Balancing Economic Development and Environmental Goals

Economic priorities in Punjab, especially about agricultural development and industrial development, come into conflict with high environmental measures at times. For instance, policies that aim at reducing stubble burning or incentivizing water savings in irrigation methods have to take into account the demands of farmers who want high short-term yields. Similarly, industrial emission standards, even though they follow global climate norms, may be seen as burdensome for local businesses, which are worried about their competitiveness and operational costs. This tension illustrates a larger problem of climate policy, which is finding a balance between climate policy and sustainable development, economic development, and social acceptability. Without carefully designed incentives or compensation mechanisms, measures that are consistent with international goals may encounter resistance, so that they are less effective.

Political Commitment and Policy Continuity

The adoption of international standards for climate at the state level is often subject to the political will, as well as the continuity of administration. Changes in government, policy priorities, or leadership can lead to changes in focus, delays, or even suspension of ongoing projects. Long-term demands for commitments for climate action - such as renewable energy infrastructure, large-scale afforestation, or water resource management - all require political support, stakeholder engagement, and legislative reinforcement over time. In Punjab, sporadic political attention to environmental issues resulted in some piecemeal environmental implementation and made cumulative benefits to climate change, or achieve the full potential of targets under national frameworks arrived at by an international agreement.

Socio-Cultural and Behavioral Factors

Lastly, the use of climate-friendly practices is affected by socio-cultural behaviors. For instance, work to prevent burning of crop residue involves changing long-standing agricultural practices, plans for new machines, and developing awareness of the climate impacts of burning. Similarly, the adoption of renewable energies or the implementation of water conservation practices depend on the participation of the population and their behavioural adaptation. With no targeted awareness campaigns and capacity building initiatives, international climate objectives may not translate well into local action, regardless of the provisions in the policy. In conclusion, while the state of Punjab shows good alignment with the international climate agreements in terms of policy, localising these goals is constrained in the following ways:

- Environmental goals that are sometimes at odds with economic and industrial priorities.
- Two main political, economic, and social challenges were identified
- Too much reliance on political commitment and continuity of policies in the FYR of Macedonia
- Weak coordination of policies - Little political commitment to education.
- Socio-cultural barriers to behavioral change.
- What are the socio-cultural barriers to behavior change?

Addressing these challenges will require an integrated strategy with institutional strengthening, financial support, stakeholders' incentives and public awareness programs. Only then will sub-national policies be able to not only mirror international norms but generate real, long-term gains, both environmental and climatic

CONCLUSION AND RECOMMENDATIONS

International climate accords, such as the UNFCCC and the Paris Agreement, have had a major impact on environmental policy in Punjab in terms of setting global norms and incentivizing adherence to mitigation and adaptation goals. The state's initiatives in air quality management, climate action planning, renewable energy adoption, and emissions reduction are examples of the increasing responsiveness of the state to international frameworks. Punjab's integration of climate-resilient agriculture, water resource management, and reduction measures for non-CO2 pollutant emissions goes on to prove that global commitments have been turned into actionable local policies. Despite these advances, there are still implementation gaps which operate from fragmented governance, inadequate financial and technical capacity, socio-economic constraints, and the need for sustained political commitment. To build stronger climate governance, it is reported that Punjab: (1) needs to improve institutional coordination and capacity to effectively implement policy; (2) needs to mainstream the climate adaptation policies and approaches in agricultural, water and urban management frameworks; (3) needs to actively tap international finance, technology transfer and partnerships to support clean energy and sustainable infrastructure; and importantly (4) needs to discharge public awareness and stakeholder engagement and facilitate behavioural change and participation to ensure broad-based participation and long-term sustainability in environmental matters.

References

1. Damro, Chad et al. (2008), "The EU and Climate Change Policy: Law, Politics and Prominence at Different Levels", *Journal of Contemporary European Research (JCER)*, Vol. 4, Issue 3.
2. Ghuman, Ranjit Singh (2003), "Punjab Agriculture: Achievements, Problems and Challenges", *Research Journal of Social Science*, Vol. 11, No. 2.
3. Gill, Anita and Lakhwinder Singh (30 June 2006), "Farmers Suicides and Response of Public Policies: Evidence, Diagnosis and Alternatives from Punjab" *Economic and Political Weekly*.

4. Kashyap, Aparjita (January-June 2004), "International Politics of Environment: Role and Responses of Amazonian Countries", *India Quarterly: A Journal of International Affairs*, Vol. LX, Nos. 1&2.
5. Kaur, Amandeep and Gaurav Kumar (July, 2014), "Ground Water Problems in Punjab: A Matter of Concern", *The International Journal of Humanities and Social Studies*, Vol. 2, Issue 7.
6. Kukal, S.S. and Parbhjot Kaur (August 22, 2013), "Punjab must Study Climate Change Effect", *The Tribune*, Chandigarh.
7. R. Iyer, Ramaswamy (July 31, 2004), "Punjab Water Imbroglio: Background, Implications and the Way Out", *Economic and Political Weekly*, Vol. 39, No. 30.
8. Sedhuraman R. (March 14, 2016), "Stop Punjab from returning acquired land, Haryana Tells SC," *The Tribune*.
9. Surinder Singh (2000), "Ground Water Depletion in Agro-Climate Regions of Punjab: Management Alternatives and Long-Term Policy Perspective", *Social Science Research Journal*, Vol. 8, Nos. 1&2.
10. UN and Environment: *The UN Works to Protect Our Environment* (June 2000) ,UN Newsletter, Vol. 55, No. 23, New Delhi: United Nations Information Centre.
11. Agarwal, S.K. & P.K. Dubey (2002), *Environmental Controversies*, New Delhi: APH.
12. Balwinder Singh (2000), *Agricultural Growth: Sources, Problems and Emerging Issues*, New Delhi: Deep and Deep Publications.
13. Bansal, P.C. (2004), *Water Management in India*, New Delhi: Concept Publishers.
14. Bhalla, G.S. (1983), *Green Revolution and the small peasant: a study of income distribution among Punjab cultivators*, New Delhi: Concept Pub. Co.
15. Carter, O'Neil (2007), *The Politics of Environment*, New York: Cambridge University Press.
16. Iqbal, S.A. (1991), *Environmental Pollution: Causes, Effects, Control*, New Delhi: Commonwealth Publishers.
17. Kutting, Gabriela (ed., 2011), *Global Environmental Politics: Concepts, Theories and Case Studies*, London and New York: Routledge.
18. COP21 – Paris Climate Conference 2015. (n.d.). *About COP21: UNFCCC*.
19. Paris Agreement. (2015). *Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC)*. (Effective November 4, 2016).
20. UNFCCC COP19 Press Coverage. (2013). *COP19 Warsaw Climate Change Conference*.
21. United Nations Framework Convention on Climate Change (UNFCCC). (1992). *United Nations Framework Convention on Climate Change*. United Nations.

22. WRI. (2014). *WRI at UNFCCC COP20: Lima, Peru, December 2014*. World Resources Institute.
23. Government of India, Ministry of Environment, Forest and Climate Change. (2008). *National Action Plan on Climate Change (NAPCC)*.
24. International Energy Agency (IEA). (2021). *National Action Plan on Climate Change (NAPCC), India*.
25. Centre for Environment Education (CEE India). (n.d.). *Punjab State Action Plan on Climate Change (PbSAPCC)*.
26. Institute for Governance & Sustainable Development (IGSD). (2025). *Punjab launches landmark report on non-CO₂ pollutants for cleaner air and climate action*.
27. Ministry of Environment, Forest & Climate Change (MoEFCC). (2017). *Punjab State Action Plan on Climate Change*. Government of India.
28. Times of India. (2025, September). *Punjab announces measures to support renewable energy developers*.
29. Times of India. (2025, September). *Punjab readies action plan to control stubble burning in ongoing season*.